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JP/rj  
4-7-59

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ALEKSANDROV, V.G.; ZHESTYANIKOVA, L.L.

Effect of ramosity of the spike on the structure of the wheat kernel.  
Trudy Bot.inst. Ser.7 no.3:212-225 '52. (MIRA 8:4)  
(Wheat)

ZHESTYANIKOVA, L. L.

"Anatomical Structure of the Membrane of a Wheat Seed and Its Significance in the Classification of the Genus Triticum." Cand Biol Sci, All Union Inst of Plant Growing, VASKhNIL, Leningrad, 1954. (RZhBiol, No 4, Feb 55)

SO: Sum. No. 631, 26 Aug 55-Survey of Scientific and Technical Dissertations Defended at USSR Higher Educational Institutions (14).

ZHESTYANNIKOV, L. A. and M. M. KOVRIN

"F2 Ionospheric Layer During the Soral Eclipse of February 25, 1952 in Gorkiy"

(Total Eclipse of the Sun, February 25, 1952 and June 30, 1954, Transactions  
of the Expedition to Observe Solar Eclipses) Moscow, Izd-vo AN SSSR, 1958,

L 38207-66 EWT(m)

SOURCE CODE: UR/0120/66/000/003/0209/0210

ACC NR: AP6022034

AUTHOR: Zhetbayev, A. K.; Kaipov, D. K.; Smirin, L. N.; Tyshchenko, A. P.

ORG: Institute of Nuclear Physics, AN KazSSR, Alma-Ata (Institut yadernoy fiziki AN KazSSR)

TITLE: Cell for electrodeposition of radioactive isotopes

SOURCE: Pribery i tekhnika eksperimenta, no. 3, 1966, 209-210

TOPIC TAGS: electrodeposition, isotope, radioactive isotope

ABSTRACT: A better design of an electrolytic cell (as compared to those described by A. Mastachi, Nucl. Instr. and Meth., 1964, v. 26, no. 2, 219 and I. S. Stephen, ibid., p. 269) is suggested. U-tube 1 (see Fig. 1) houses Pt anode 2 and terminates with stainless-steel cathode 3; solenoid 4 produces a pulsating magnetic field for stirring the electrolyte. The radioactive isotope is deposited on substrate 5. The cell was used for preparing Mossbauer  $\text{Co}^{57}$  sources; electrolyte composition and other data are reported. Orig. art. has: 1 figure.

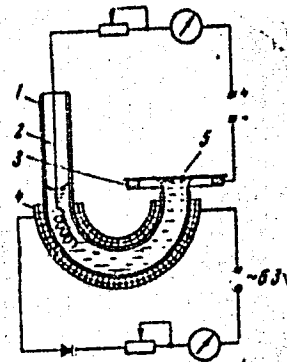


Fig. 1. Electro-  
[03] deposition cell

SUB CODE: 18, 09 / SUBM DATE: 20Apr65 / OTH REF: 003/ ATD PRESS: 5044

Card 1/1

UDC: 621.039.554

L 44398-66 EWT(m)/EWP(t)/ETI IJP(c) JD/WB  
 ACC NR: AP6024526 SOURCE CODE: UR/0148/66/000/007/0114/0118

AUTHOR: Shreyber, G. K.; Zharbin, N. P.; Saakiyan, L. S.; Laisova, I. Ya.

ORG: Institute of the Petrochemical and Gas Industry (Institut neftekhimicheskoy i gazovoy promyshlennosti)

TITLE: The influence of deformation on intercrystalline corrosion of type 18-8 stainless steel

SOURCE: IVUZ. Chernaya metallurgiya, no. 7, 1966, 114-118

TOPIC TAGS: annealing, metal deformation,  
stainless steel, corrosion resistance, metal grain structure, magnetic saturation / 2Kh18N9 steel

ABSTRACT: The effect of preliminary deformation and tempering on intercrystalline corrosion of 18-8 stainless steel was studied. 2Kh18N9 steel was deformed, after annealing: 37, 15, 10 and 0% at +20 and -70°C. All wire samples were subsequently annealed at 550 and 650°C for 2, 4 and 8 hrs. The amount of  $\alpha$ -phase present was determined on a magnetometer. By lowering the deformation temperature to -70°C, greater amounts of  $\alpha$ -phase formed. The magnetic saturation increased rapidly after 10% deformation, the more so for unannealed specimens. Samples were boiled for 24 hrs in a standard solution (160 g  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ , 100 ml  $\text{H}_2\text{SO}_4$  of density 1.84 g/cm<sup>3</sup> in 1000 ml of water in the presence of copper chips). After boiling, samples were measured for

UDC: 669.14.018.8-12:620.196

Card 1/2

L 44398-66

ACC NR: AP6024526

electrical resistivity ( $\Delta\rho/\rho_0 \cdot 100\%$ ), bent at right angles on a press with a radius of curvature of 5 mm and examined with an eyeglass after one bend and ten bends. Data are given for a variety of testing conditions: the above deformation temperatures, % deformation and tempering cycles. For any particular set of test conditions, qualitative descriptions of the bend surface are included, e. g., no cracking, deep cracks, average number of cracks, etc. Plastic deformation increased the rate of intercrystalline corrosion while decreasing the rate of general corrosion in most of the samples. The relative decrease in diameter of the "active" section is given as a function of deformation for different deformation and tempering temperatures. The relative change in resistivity is given as a function of tempering time. Optimal conditions for preventing intercrystalline cracking in 18-8 stainless steel are presented in a three-dimensional plot of the experimental conditions. Deformation at  $-70^\circ\text{C}$  transformed more of the  $\gamma$ -phase into the ferromagnetic  $\alpha$ -phase and its influence on corrosion was more pronounced than for  $+20^\circ\text{C}$ . Orig. art. has: 4 figures, 1 table.

SUB CODE: 11,20/ SUBM DATE: 28Mar66/ ORIG REF: 005/ OTH REF: 004

Card 2/2 *egk*

NEKRASOVSKIY, Ya.E., prof., doktor tekhn. nauk; ZHETESOV, S.S., gornyy inzh.

Effect of the seam thickness on the basic technical and economic indices of a longwall in the mining of thick horizontal coal seams. Ugol' 40 no.8:30-32 Ag '65.

(MIRA 18:8)

1. Dnepropetrovskiy gornyy institut.

MALAKHOVSKIY, Yakov Emmanuilovich; GOL'DBERG, Georgiy Isayevich;  
ZHETIKOV, S.D., red.; TYAGUNOVA, Z.I., red.

[French-Russian motor-vehicle and tractor dictionary]  
Frantsuzsko-russkii avtotraktornyi slovar'. Moskva, So-  
vetskaya Entsiklopediya, 1965. 459 p. (MIRA 18:10)

ZHETIMKARINOV, D.S.

Sarcoma of the small intestine in a child. Zdrav. Kazakh.  
22 no.9:73-74 '62. (MIRA 17:2)

1. Iz khirurgicheskogo otdeleniya meditsinskoy sanitarnoy  
chasti myasokombinata g. Semipalatinska.

AMIYAN, V.A.; SHTYRIN, V.F.; KONEV, V.D.; NOZDREV, A.Ye.;  
KALICHENKO, B.V.; ZHETLUKHIN, Yu.L.

Determination of the nature of flooding of well IV in the  
Maotic horizon of the Anastasiyevka-Troitskoye field based  
on the parameters of production performance. Nefteprom. delo  
no.8:3-5 '65. (MIRA 18:9)

1. Institut geologii i razrabotki goryuchikh iskopayemykh, Moskva,  
i Neftepromyslovoye upravleniye "Priazovneft"

ZHETOV, Yu. P. (Moscow)

"A Mechanical Model Representing the Process of Crack Formation in Rocks."

report presented at the First All-Union Congress on Theoretical and Applied Mechanics, Moscow, 27 Jan - 3 Feb 1960.

BOGOYAVLENSKIY, M.S.; VASHCHENKO, A.I.; DENISOV, A.N.; ZHETVIN, A.N.; ZEN'KOVSKIY, A.G.; MAKAROV, D.M.; MAKSIMOV, B.M.; FILATOVA, A.I.; SHABUNIN, Ye.M.

Oxidation and decarburizing of certain steels in duo-muffle furnaces of nonoxidizing heating. Stal' 23 no.12:1124-1126 D '63. (MIRA 17:2)

ZHETVIN, D.

Beets and Beet Sugar

Increasing the saccharinity of sugar beets. Kolkh. proizv., 12, No. 7, 1952

Monthly List of Russian Accessions, Library of Congress, October 1952. UNCLASSIFIED.

1. ZHEVIN, D.
2. USSR (600)
4. Feeding and Feeding Stuffs
7. Beet chips are valuable as fodder. Kolkh. proizv. 12 No. 10, 1952.

9. Monthly List of Russian Accessions, Library of Congress, January 1953. Unclassified.

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APPROVED FOR RELEASE: 03/15/2001

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ZHETVIN, N.P.

Call Nr: TS 213.245

AUTHOR:

Zhetvin, N.P., Rakhovskaya, F.S., Ushakov, V.I.

TITLE:

<sup>NIKITA PETROVICH</sup>  
Descaling of Metals (Udalenie okaliny s poverkhnosti metala) Methods Employed by the "Serp i Molot" Plant (Opyt zavoda "Serp i Molot")

PUB. DATA:

Gosudarstvennoye nauchno-tekhnicheskoye izdatel'stvo literatury po chernoy i tsvetnoy metallurgii, Moscow, 1957, 108 p., 4,000 copies

ORIG. AGENCY: None given

EDITOR:

Ed.: Gamov, M.I.; Ed. of the Publishing House: Berlin, Ye.N.; Tech. Ed.: Attonovich, M.K.

PURPOSE:

This is a manual for engineers and foremen engaged in metallurgical and machine-building plants.

COVERAGE:

This book contains a description of the most advanced methods of descaling by acid and alkaline pickling, as well as of the electrolytic and the hydride method.

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Call Nr: TS 213.245

# Descaling of Metals (Cont.)

The authors believe that the methods of pickling stainless austenitic Ni-Cr steels, semiferritic and ferritic high-chrome steels, and also of nickel and titanium alloys have as yet been insufficiently investigated and present many problems. They state that this book is an attempt to classify experiments in pickling and to show new approaches to this problem. Disadvantages and limitations of the acid pickling method are discussed. Experiments with sodium hydride methods are described. Methods of neutralizing and recovery of spent pickling solutions are also mentioned. There are numerous diagrams, tables, and chemical data. There are 29 references; of which 15 are Soviet, and 14 English.

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Descaling of Metals (Cont.)

Call Nr: TS 213.245

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AVAILABLE: Library of Congress

Card 3/3

AUTHOR: Zhetvin, N.P., Candidate of Technical Sciences, and 289  
 Belosevich, V.K., Engineer.  
 TITLE: Rolling and heat treatment of titanium. (Prokatka i termicheskaya obrabotka titana.)  
 PERIODICAL: "Tsvetnye Metally" (Non-ferrous Metals),  
 1957, No. 1, pp. 72 - 81, (U.S.S.R.)

ABSTRACT:

In this article, the results are given of a practical investigation of the rolling of section and flat products from technical titanium and from titanium alloyed with aluminium. The heat treatment and metallographic investigation of these materials were also studied in the investigation. No particular difficulties were encountered in rolling sections from the titanium-aluminium alloy; finishing operations are best carried out at 200-300 °C. The hot rolling of sheet from both technical titanium and the alloy with aluminium is suitable to a thickness of 2.0 - 2.4 mm. Forged billets are used as a starting material for the hot rolling. Although packet-rolling of sheet can be carried out to a thickness of 0.8 - 1.0 mm, the considerable intake of oxygen and hydrogen which occurs makes this inadvisable. Technical titanium can advantageously be cold rolled into sheets to 0.8 mm thick and narrow strip to 0.3 and less mm thick. The cold rolling of sheet from the aluminium-containing alloy is practicable to a thickness of 1.0 mm.

Rolling and heat treatment of titanium. (Cont.) 289

Heating for rolling and heat treatment should be carried out in an oxidising atmosphere at the lowest possible temperatures and in the shortest possible time, this leading to scale-formation conditions which have the least effect on the resistance to etching and on the mechanical properties of the alloy. Technical titanium should be alloyed at 680-700 °C, the other with aluminium at 750-800 °C; four to five minutes soaking time should be provided for every mm of thickness of flat products. To destroy brittleness and improve the toughness of hot-rolled sections from the aluminium-containing alloy, they must be subjected to annealing at a temperature of 730-750 °C for 9-10 hours. A sodium hydride melt in alkali is the method recommended for scale-removal; for a very light scale, obtained at 700-760 °C, however, an alkali-sodium nitrate melt can be used.

There are 3 tables and 8 figures. There are 7 references of which 4 are Russian.

BEDA, N.I.; BORNATSKIY, I.I., kandidat tekhnicheskikh nauk; BUL'SKIY, M.T.,  
inzhener; SVIRIDENKO, F.F., inzhener; BERILOV, N.T., inzhener;  
ZHETVIN, N.P.

Metallurgical plant laboratories in 1957. Metallurg 2 no.8:1-5 Ag  
'57. (MIRA 10:9)

1. Nachal'nik TSentral'noy zavodskoy laboratorii zavoda im. Petrovskogo  
(for Beda). 2. Zamstitel' nachal'nika TSentral'noy zavodskoy labora-  
torii Makeyevskogo metallurgicheskogo zavoda im. Kirova (for Bornatskiy).
3. Zavod "Azovstal'" (for Bul'skiy, Sviridenko, Berilov). 4. Nachal'-  
nik TSentral'noy zavodskoy laboratorii zavoda "Serp i molot" (for  
Zhetvin).

(Metallurgical laboratories)

AUTHOR: Zhetvin, N.P., Engineer.

133-5-25/27

TITLE: Research work of the "Serp i Molot" Works. (Issledovatel'skiye Raboty Zavoda "Serp i Molot".)

PERIODICAL: "Stal'" (Steel), 1957, No.5, pp. 472-475 (U.S.S.R.)

ABSTRACT: 1) The use of intensive heating of the shrinkage head. In order to decrease the proportion of metal cut off during rolling killed steel various methods of heating the ingot shrinkage head were investigated. The heating of the shrinkage head was done by burning 75% ferro-silicon in a stream of oxygen. For small ingots a mixture of ferro-silicon and sodium nitrate as a source of oxygen for the ignition of ferro-silicon was used. The optimum composition of the heating mixture: 70% ferro-silicon, 20%  $\text{NaNO}_3$ , 10% chamotte powder. The mixture is used in a proportion of 1.0 - 1.2 kg/ton of liquid metal. The other mixture used consists of 70% ferro-silicon (75%), 10% silico-calcium and 20%  $\text{NaNO}_3$ . All shrinkage heads were decreased in size by increasing the slope and decreasing the height from 300 to 275 mm. Altogether 2.1 - 2.2% increase in the output of good metal was obtained.

2) The production of low carbon electro-technical steel with a vacuum treatment of metal in ladles. The equipment for

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Research work of the "Serp i Molot" Works. (Cont.) 133-5-25/27

vacuum treatment was designed by the Institute of Metallurgy of the Ac.Sc. SSSR (Institut Metallurgii AN SSSR). It was found possible to decrease the carbon content from 0.10 - 0.12% to 0.035 - 0.025% by a 6-9 min. vacuum treatment in ladles. The magnetic properties of the metal are not improved by this treatment probably due to insufficient pumping power of the PMK-4 pumps.

3) Steelmaking in a recuperative furnace.

Two campaigns of making steel in a 10 ton recuperative furnace were carried out. Results are given in the table. It was found difficult to obtain medium carbon steels of exact carbon content. Some defects in the design of the furnace (not specified) were found which will be corrected for the forthcoming 3rd campaign.

4) Roller passes for a wire drawing mill 750.

Introduction of roller passes increased the output of the mill by 6-7%. Rollers' service life 40 to 50 shifts; they are cast from steel of the following composition: 2% C, 1% Mn, 0.5% Si, 23-25% Cr, 1.5% Ni, 1.0 - 1.5% W.

5) The determination of the causes of formation of "scale".

This defect appears on the rolled surface in the form of rolled surface cracks. It was established that the defect is caused

Card 2/4

Research work of the "Serp i Molot" Works. (Cont.) 133-5-25/27

by joint action of arsenic, tin and copper which do not dissolve during heating in scale thus enriching surface layers causing a local loss of plasticity. Dressing of the metal with "coarse scale" is not effective as the defect reappears on reheating and rolling. Fine "scale" can be dressed.

6) The production of cold rolled sheets from high speed cutting steel. The production of this material with a smooth surface allowed some decreases in allowances during the production of flat cutters.

7) Cold rolling of stainless strip. The operation of a light roller mill UK5MM-38 for rolling strip was somewhat improved by some changes in diameters of working rolls. However, the improvement was insufficient and it was decided to use it only for rolling strip 20 mm or less, thick.

8) Roller furnace for thermal treatment of stainless steel. Operating practice for this furnace was determined for treatment of various steels. The possibility of increasing the stability of rollers at the prevailing temperature of 1 080 - 1 100 °C is under investigation.

9) Production of patented wire with a low oxidised surface. By isolation of wire from combustion gases in the furnace and from atmosphere during its passage from the furnace to the

Card 3/4

Research work of the "Serp i Molot" Works. (Cont.) 133-5-25/27  
patenting bath, a wire with a low oxidised surface requiring short pickling (5-8 min) was obtained. However, the velocity of subsequent drawing could not exceed 250 m/min as due to smoothness of the surface soap powder was not drawn into the die.

10) The production of wire from steels Y7A6, and Y10A. A new technology of the production of wire from the above steels (for the watch-making industry) was developed. Hardening of rods from 780-800 °C in soapy water heated to 70-80 °C annealing at 690 °C during 6 hours with subsequent intermediate annealing at 690 °C for 1.5 hours. Using this technology, wire with uniform pearlitic grain is obtained.

11) The removal of scale from stainless steel with sodium hydride. Stable scales can be removed by treatment with a molten alkali containing sodium hydride. The losses of metal are insignificant as the hydride reacts only with scale. Due to the instability of the hydride the range of working temperatures is narrow: 360-370 °C. There is one table.

AVAILABLE:

Card 4/4

ZHETVIN, N.P.

136-6-20/26

AUTHOR: (Kalugin,) V.F., Candidate of Technical Sciences.

TITLE: On the Article "Rolling and Heat Treatment of Titanium" by N.P. Zhetvin and V.K. Belosevich. (Po povodu stati N.P. Zhetvina i V.K. Belosevicha "Prokatka i Termicheskaya Obrabotka Titana".)

PERIODICAL: Tsvetnyye Metally, 1957, No.6, pp. 78-80 (USSR)

ABSTRACT: The writer of this letter to the editor is supervisor of the rolling group for the VIAM organisation. He strongly criticises recommendations and omissions in an article by Zhetvin and Belosevich published in Tsvetnyye Metally, No.1. On the part "Production of Sections", he maintains the authors' suggestions for surface cleaning and heat treatment are misleading and gives a table of results obtained at his organisation on the mechanical properties of titanium after rolling with and without subsequent vacuum treatment. The misleading nature of the part "Hot Rolling of Sheets" he attributes to the authors' ignorance of practical work carried out elsewhere. The writer goes on to cite experimental data which showed the satisfactory plasticity of technical titanium when cold-rolled with stretching. The authors' recommendations on heat-treatment he considers incomprehensible, and because of omission of Card 1/2 analyses, incapable of application to titanium-aluminium

136-6-20/26

On the Article "Rolling and Heat Treatment of Titanium" by  
N.P. Zhetvin and V.K. Belosevich.

alloys. Finally, he quotes experimental results obtained by  
N.A. Koshvheyeva and L.N. Kononenko at the Zaporozhstal' Works  
on the etching of titanium sheet and mentions that etching of  
titanium by the alkali-acid method was first adopted at the  
Elektrotsink Works with the participation of his organisation.

ASSOCIATION: VIAM

AVAILABLE: Library of Congress

Card 2/2

2121412, A. P.

133-7-5/28

**AUTHOR:** Zhetvin, N.P., Candidate of Technical Sciences, Lebed'kov, A.A., Tunkov, V.P. and Zaytseva, A.D., Engineers.

**TITLE:** Raising the Yield of Metal by Using Hot Ingot Tops (Povysheniye vykhoda godnogo putem obogreva pribyl'noy chasti slitka)

**PERIODICAL:** Stal', 1957, No.7, pp. 587 - 592 (USSR)

**ABSTRACT:** Investigations carried out on the "Serp i Molot" Works on heating hot top of ingots of killed steel and riser for large steel castings are described. The following participated in the work: Engineers G.V. Sviridov, V.M. Maksimov, P.I. Mel'nikov, A.V. Rabichev, V.I. Tvirov, I.I. Fomin, A.I. Filatova and laboratory assistants I.P. Zabolkin, I.D. Ob'edkov and others. The usual works' practice was to team 75-ton open hearth heats into 84 to 90 moulds (0.8 ton). Bottom pouring of ingots placed on 12 ingot stools with filling sinkheads with bunkerite was used. Cropped head for carbon steel was 13 - 13.5% and for some low alloy steels 15-16%. Ingot dimensions: top 330 x 330 mm, bottom 275 x 275 mm, height 1 085 mm. The use of the following substances for heating hot tops was tested: 75% ferro-silicon (crushed to -2 mm) 5 - 6 kg per ingot with a supply of oxygen (2 - 3 min) and 6 mixtures of ferro-silicon, aluminium, sodium nitrate, chamotte powder and silico-calcium in various proportions and combinations. The composition of mixtures numbered

133-7-5/28

## Raising the Yield of Metal by Using Hot Ingot Tops.

1 - 6 is given. The structure of the ingot with heating top with ferro-silicon is shown in Fig.1, methods of sampling ingots in Fig.2, comparison of macrostructure of longitudinal templets of ingots (Al2 steel) with heating sinkhead with lunckerite and mixture 5 in Fig.3. Gas content in various parts of an ingot cast with intensive heating of the sinkhead and chemical composition of samples from longitudinal templets of ingots heated with lunckerite and mixture 15 are given in Tables 1 and 2, respectively. As the next step in saving metal, the shape of sinkhead was modified (Fig.4) and the insulation of hot tops improved (Fig.5). It is concluded that the use of intensive heating of hot tops of large ingots and large shaped castings by combustion of 75% ferro-silicon in a stream of oxygen improves the quality of ingots and castings and gives an economy of metal from 4 to 15%. The method of heating hot tops of ingots not larger than 1 ton using mixture No.5, (70% of 75% ferro-silicon, 20% of sodium nitrate, 10% chamotte powder) for ingots stripped with clamps and mixture No.6 (70% of 75% ferro-silicon, 20% sodium nitrate and 10% silico-calcium) for ingots and medium shaped casting for which clamps are not used, also improves the quality of ingots and castings and gives an economy of metal from 12.5% for ingots to 15% for castings. Considering that the work

Raising the Yield of Metal by Using Hot Ingot Tops.

133-7-5/28

was carried out with 800 kg ingots, application of the above heating method for larger ingots should be additionally checked. During 9 months of operating according to the new practice crop ends were decreased by 2.3% and defects due to microstructure to 0.21% instead of the previous figure of 0.50%. There are 5 figures and 2 tables.

ASSOCIATION: Serp i Molot Works (Zavod "Serp i Molot")

AVAILABLE: Library of Congress.

Card 3/3

130-58-5-11/16

AUTHORS: Maksimov, B.M., Zhetvin, N.P., Ivanov, A.A. and Babkov, G.V.

TITLE: Roller Guides on a 250 Wire Mill (Rollkovyye propuski na provolochnom stane 250)

PERIODICAL: Metallurg, 1958, Nr 5, pp 28 - 30 (USSR).

ABSTRACT: Roller instead of slip guides have been successfully used for the last five years when rolling 30-65 mm dia. rounds. The advantages of roller guides are outlined by the authors who discuss the difficulties which arose through high rolling speeds when such guides were used with 5-8 mm dia. wire. At the "Serp i Molot" Works, the 250 wire mill is used to roll low-carbon, medium-carbon, tool (U7 - U13), austenitic and ferritic stainless (type 1Kh18N9T, "ferrodit"), heat-resisting, high-speed and other steels into coiled 5.25-12.0 mm dia. wire. A fairly satisfactory slip guide was developed at the works jointly with the Moskovskiy institut stal' (Moscow Steel Institute) in 1954 but this still gave a defective product and a roller guide (Figures 1, 2) was constructed. This has one pair of rollers, is quickly and easily mounted and demounted and has some interchangeable bearings. For ease of passing the strip into the rollers and protecting the latter tubular cone guides are provided made,

Card1/2

Roller Guides on a 250 Wire Mill

130-58-5-11/16

like the rollers, of chromium-nickel-vanadium steel (1.8-2.2% C, 0.8-1.2% Mn, 0.5-1.0% Si, 23-25% Cr, 1.5-2.0% Ni, 1.0-1.3% W, 0.3-0.6% V, under 0.045% S and under 0.05% P. Two cone guides in series are provided, the feed-end one being held in position with a wedge which facilitates the clearing of cobbles. This type of guide the authors recommend both with manual and repeater operation. On the 450 and 300 mills at the works, guides with two pairs of rollers (Figure 4) are used but they have not proved satisfactory, whereas the one-pair types gave good results even when deliberately mis-aligned. The durability of a pair of rollers is up to 40-45 and 18-20 shifts on the Nr 2 and 3 lines, respectively, of the 250 mill. There are 4 figures.

ASSOCIATION: Zavod "Serp i Molot" ("Serp i Molot" Works)

Card 2/2

SOV/133-58-6-24/33

AUTHOR: Zhetvin, N.P., Candidate of Technical Sciences

TITLE: In the "Serp i Molot" Plant (Na zavode "Serp i Molot")

PERIODICAL: Stal', 1958, nr 6, p 549 (USSR).

ABSTRACT: 1) Determination of power reserves of the mill 450 (in co-operation with TsNIITMASH)  
In order to obtain a rational loading of the mill, the actual loads on the individual parts and mechanisms of the reducing stand under normal operating conditions were established. This made it possible to determine the possibility of increasing the throughput of the mill, by improving the design of the roll passes and the rolling technology by a more uniform distribution of reduction in the individual passes. Similar investigation of loads on the finishing line will be carried out.  
2) Development of the technology of rolling of thin sheets for the production of polished drums.  
It was found that sheets for the purpose can be obtained only from stainless metal free from carbonitrides of titanium. Steel OKhl8N9 smelted in arc furnaces from fresh materials was found to be most suitable. Steel is cast into 500 kg ingots which, before forging, are dressed to a depth of 15-20 mm. Forged slabs are dressed before hot rolling. Hardened sheets

Card 1/2

In the "Serp 1 Molot" Plant

SOV/133-58-6-24/33

2 x 710 x 1800 mm are made with all precautions to obtain good surface. With a low content of non-metallic inclusions and insignificant separation of the ferritic phase, the metal can be well polished.

3) The development of preventive measures against the formation of bubbles in rimming steel for thin sheets.

By a strict control of pickling conditions, the defects due to bubbles decreased from 0.44% to 0.09%. It was found that the formation of bubbles depends on the properties of metal; under the same conditions of pickling only part of heats shows a tendency to the formation of bubbles.

Card 2/2 1. Rolling mills--Performance 2. Rolling mills--Applications  
3. Steel--Processing 4. Steel--Quality control

SOV/133-58-6-27/33

AUTHOR: Zhetvin, N.P., Candidate of Technical Sciences

TITLE: In the "Serp i Molot" Plant.. The development of Measures to Increase the Life of Rollers in the Furnace for Thermal Treatment of Sheets (Na zavode "Serp i Molot". Razrabotka meropriyatiy po pvysheniyu sroka sluzhby rolikov pechi dlya termicheskoy obrabotki lista)

PERIODICAL: Stal', 1958, Nr 6, p 558 (USSR).

ABSTRACT: Rollers made from chromiumnickeltungsten steel (C 0.45-0.60, Mn 0.65-1.50, Si 0.85-1.50, Cr 26-30, Ni 46-52, W 4-5%) were tested with satisfactory results.

Card 1/1      1. Furnaces--Equipment    2. Steel--Applications

ZHEIVIN, V.I.

AUTHOR: Slavkin, v.S.

SOV/130-58-7-35/35

TITLE: "Removing Scale from the Surface of Metal" (Udalenie  
okaliny s poverkhnosti metalla) New Book by M.P. Zhetvin,  
F.S. Rakhovskaya and v.I. Ushakov. Published in 1957  
by Metallurgizdat.

PERIODICAL: Metallurg, 1958, nr 7, p 48 (USSR).

ABSTRACT: This is a review, on the whole favourable, of the  
above book.

Card 1/1

1. Metals--Scale

USCOMM-DC-55404

Sov/133/58-9-24/29

AUTHOR: Zhetvin, N. P. (Cand. Tech. Sciences)

TITLE: At the Works "Serp i Molot" (Na zavode "Serp i molot")

PERIODICAL: Stal', 1958, Nr 9, p 842 (USSR)

ABSTRACT: Development of drawing practice for difficult to deform steels in a preheated state in the form of wire and rods. Preheating of semis from some steels before drawing in order to improve the process of drawing and increase the output was investigated. The following optimum preheating temperatures were established: drawing of wire from steel R18 200-300°C; drawing of rods from steels Kh18, KhVG, KhG, 9KhS and Kh17N2 150-200°C. Using preheating an improvement in the operation was obtained. Search for phosphatising conditions for dry drawing of wire at rates above 300 m/min. No positive results as yet were obtained, the investigation is being continued. A study of the influence of the length of the cylindrical

Card 1/2

Sov/133/58-9-24/29

At the Works "Serp i Molot"

channel in dies on their stability.

It was found that increasing the length of the cylindrical part of the dies above 0.5 d (die diameter) sharply decreases the durability of dies, increases the number of breaks thus decreasing the output of drawing mills)

Card 2/2

SOV/133-58-8-21/30  
AUTHOR: Zhetvin, N.P., Candidate of Technical Sciences  
TITLE: At the Works "Serp i Molot" (Na zavode "Serp i Molot")  
PERIODICAL: Stal', 1958, Nr 8, p 746 (USSR)

ABSTRACT: 1) An increase in the yield of good metal in the production of killed steel by decreasing the volume of the shrinkage head of ingots.  
By the use of an exothermic mixture (65% of powdered, 75% ferro-silicon, 20% sodium nitrate, and 15% chamotte powder) the weight of the shrinkage head of ingots was decreased from 109 kg to 91 kg, thus increasing the yield of good metal by 2%. In the next stage, the shape of the top was altered (see figure) which allowed for a further decrease of the shrinkage head to 81.5 kg and correspondingly the total weight of the ingot from 805 kg to 796-798 kg. This gave an additional 1% increase in the yield of metal.  
2) The development of the technology of production of a new type of automatic steel.  
A new type of automatic steel was developed as a replacement for steel AV12. The new steel differs in chemical

Card1/2

At the Works "Serp i Molot"

SOV/133-58-8-21/30

composition and method of deoxidation (no details given)  
and possesses better rolling properties.  
There is 1 figure.

1. Steel--Production 2. Steel--Properties

Card 2/2

SOV/130-59-2-14/17

AUTHORS: Zhetvin, N.P. and Podvoyskiy, L.N.

TITLE: The "Hammer and Sickle" Works are 75 Years Old  
(Zavodu „Serp i molot,, - 75 let)

PERIODICAL: Metallurg, 1959, Nr 2, pp 36-38 (USSR)

ABSTRACT: The authors outline the history of the Moscow "Serp i molot" works from the days of its foundation in 1884. After a difficult period before and shortly after the revolution (in which many of the workers participated) the works were reconstructed and expanded to become one of the main suppliers of quality steels. The authors name some distinguished workers and the honours and decorations which have been bestowed. The works have consistently over-fulfilled government plans for twenty years, including 1958. The expanded production of stainless steel sections with a 22-fold increase, in 1946-1956 was the major post-war development, followed by high-speed steel with a 6-fold increase. The authors state that the works is now entering a second radical reconstruction which will lead to a great increase in the range of products without much increase in volume. They show some decorative uses

Card 1/2

SOV/130-59-2-14/17

The "Hammer and Sickle" Works are 75 Years Old

of "Serp i molot" stainless steels and pictures of  
works personnel and mention improvements in living  
conditions. There are 4 photographs and 1 drawing.

Card 2/2

SOV/133-59-5-10/31

AUTHOR: Zhetvin, N.P., Candidate of Technical Sciences

TITLE: At the Moscow Works "Serp i Molot" (Na Moskovskom zavode "Serp i Molot")

PERIODICAL: Stal', 1959, Nr 5, pp 419 - 420 (USSR)

ABSTRACT: 1) The production of Armco iron from rimming steel 08-10 by vacuo treatment of liquid metal in a ladle (in co-operation with the Metallurgical Institute of the Academy of Sciences of the USSR). By a vacuo treatment of rimming steel for 6-8 min, at a residual pressure of 5-10 mm Hg, carbon content of the metal can be decreased from 0.14 - 0.10% to 0.030 - 0.025%. The work is being continued.

2) The use of heating of shrinkage head of ingots with briquettes and coatings for decreasing crops. The use of exothermic briquettes (50% coke breeze, 25% charcoal, 20% dry sawdust and 5% of  $\text{NaNO}_3$ ) fixed into hot tops for killed steel ingots decreased crops by 10%. As the application of briquettes made the use of clamps impossible and the production of briquettes required a special workshop, the method was discontinued. Instead, coating of hot tops

Card1/4

SOV/133-59-5-10/31

At the Moscow Works "Serp i Molot"

with an exothermic mass (20% dry sawdust, 45% dry coke, 20%  $\text{NaNO}_3$  and 15% of fireclay) was introduced. The internal surface of the hot tops is coated with the above mass (25-30 mm thick) where it is dried by the heat from previous teeming accumulated by hot-top lining. The coating is painted with a solution of sodium silicate. On teeming the coating begins to burn when the mould is  $\frac{2}{3}$  full (the metal enters the already well-heated top) and the combustion is finished 10-15 minutes after teeming is finished. In addition, an exothermic mixture (15% aluminium, 10% silicocalcium, 40% ferrosilicon, 15%  $\text{NaNO}_3$ , 10% coke, 5% bauxite and 5% chamotte) is added on the surface of the metal. The slag crust formed after the combustion of this mixture presents a good heat insulation. As a result, an 8% crop removes the shrinkage cavity. The method is recommended for a wide application. For a further decrease in crop and simplification of the casting pit practice, some experiments were carried out on bottom teeming of killed steel in straight-through wide-end-down ingot moulds (normally

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At the Moscow Works "Serp i Molot"

SOV/133-59-5-10/31

used for rimming steel) with the addition on the surface of metal of an exothermic mixture (65% of 75% ferro-silicon, 20% of  $\text{NaNO}_3$ , 15% of chamotte powder). The

experiments are being continued.

3) An investigation of the steel-smelting process in a direct-flow metallurgical furnace (in co-operation with MEI and TsNIIChM). Before the third campaign, some modifications in the construction of the furnace were carried out: installation of two atomisers of up to 1 200 l./h capacity (instead of 1); an additional recuperator capable of preheating 20% of air from 50 - 60 to 700 - 750 °C. Altogether, 154 heats were made during the third campaign. The results obtained indicated:

- a) a decrease in the oxidising ability of the furnace (mean content of iron oxides in slag 15-16%);

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At the Moscow Works "Serp i Molot"

SOV/133-59-5-10/31

- b) a decrease in the rate of decarburisation to a level of open-hearth furnaces (0.012 - 0.015%/min);
- c) a decrease in the loss in metal yield from 10% to 6.9% .

Card 4/4

AUTHOR: Zhetvin, N.P., Candidate of Technical Sciences <sup>SOV/133-59-5-25/31</sup>

TITLE: At the Moscow Works "Serp i Molot" (Na Moskovskom zavode "Serp i Molot")

PERIODICAL: Stal', 1959, Nr 5, pp 460 - 461 (USSR)

ABSTRACT: 1) The development of practices of thermal treatment of sheets in a roller furnace and an increase in the durability of rollers. The practice of normalising sheets from carbon steels (08-10) at 1 030 - 1 050 °C. The speed of travel of the sheets corresponds to the time of 0.75 - 0.85 min/mm of thickness of the sheets. Practices for hardening stainless and heat-resistant steels are being developed. Rollers made from centrifugally cast tubes from steel Kh25N20S2 were tested with satisfactory results. New design of rollers:  
a) from ceramic components and b) from steels Kh28N48V5 and Kh20V5Yu5T2 were developed in co-operation with the "Elektropech'" Trust.  
2) The development of practices of thermal treatment of rods and wire from Kh18 steel. In order to inhibit the ageing process (dispersional hardening) which occurs during

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SOV/133-59-5-25/31

At the Moscow Works "Serp i Molot"

prolonged retention of wire in the hardened state or during its thermal treatment at a comparatively low temperature (below the lower critical point) the following changes in the production practice were introduced:

i) alkali pickling during which the wire was heated to 400-500 °C was discontinued; ii) annealing of rods of intermediate and final dimensions (heating to 720 °C with soaking for 2 hours, cooling with the furnace to 680 °C and then in air) was replaced by isothermal annealing (heating to 880 °C with soaking for 2 hours, cooling with the furnace to 700 °C, retention for 4 hours, cooling with the furnace to 650 °C and then in a pit); iii) annealing of rods directly after rolling was introduced; iv) retention of wire in a hardened state at intermediate manufacturing stages was limited to 8 hours. With the above modification, a plastic wire was obtained which could be drawn with partial reductions of 20-25% and the total reduction of 50%.

3) Production of a low-carbon electrotechnical iron with a low coercive force and minimal ageing (in co-operation

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At the Moscow Works "Serp i Molot"

SOV/133-59-5-25/31

with MATI). By annealing of metal in a stream of dry hydrogen, magnetic ageing can be reduced to a minimum (increase in the coercive force not exceeding 10-20%).

4) Search for methods of increasing wear resistance of parts made from high manganese steel (in co-operation with TsNIITMASH). As the wear resistance of parts of crushing machines made from steel G13L is lower than that of corresponding imported specimens, a research on the possibility of improving this quality of the home-made steel is being carried out. Properties and composition of 30 specimens of imported parts were studied, whereupon it was found that the upper limit of phosphorus and silicon content in the home-made parts is higher than in the imported ones. A machine for testing wear-resistant properties of parts under conditions similar to their normal operating conditions was developed and at present a method of testing which will secure the reproducibility of results is being worked out.

5) An investigation of the kinetics of decarburisation of tool and ball-bearing steel during thermal treatment.

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At the Moscow Works "Serp i Molot"

SOV/133-59-5-25/31

The process of decarburisation of steels U12A and ShKh9 during thermal treatment under laboratory and industrial conditions has been studied. It was found that:

- a) on annealing at temperatures up to 740 °C with soaking up to 16 hours under oxidising conditions and in the presence of fresh iron filings, the decarburisation process does not develop either in rolled (with scale) or in machined specimens. Annealing above 740 °C leads to the formation of plate pearlite; b) the decarburisation at temperatures above 740 °C accelerates in time. In oxidising atmosphere and on machined specimens the decarburisation begins at 760 °C after soaking time of above 8 hours, at 780 °C after 4 hours, at 800 °C after 2 hours and at 820 °C after 1 hour; c) in the surface zone of specimens covered with scale, an insignificant increase in carbon concentration (up to 0.18%) is observed (due to diffusion) which never equalises with the composition of the main metal; d) an increase in the carbon content of the surface layer of specimens with scale confirms the protective action of the scale against decarburisation during thermal treatment.

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At the Moscow Works "Serp i Molot"

SOV/133-59-5-25/31

Pickling of rolled products before annealing promotes decarburisation; e) on annealing in a tube with fresh iron filings at temperatures up to 800 °C and soaking up to 8 hours no decarburisation of steel ShKh9 was observed (on annealing without tubes or in tubes at temperatures above 800 °C decarburisation of both steels takes place). The statement of some authors that the decarburised layer can pass into scale was not confirmed by the experiments.

6) Development of a practice for continuous contactless electrolytic method of pickling wire. Laboratory pickling was carried out on a two-bath apparatus. In the first bath, wire from carbon and 1Kh18N9T steels was submitted to cathodic and, in the second, to anodic pickling. The influence of the composition of electrolytes, their temperatures, current density and pickling velocity were studied. Optimum pickling conditions (quoted in the text) were established.

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At the Moscow Works "Serp i Molot"

SOV/133-59-5-25/31

7) Development of pickling practice for molybdenum sheets.  
The following pickling conditions were established:

- i) treatment of the metal in a molten bath containing 80% of NaOH and 20% of  $\text{NaNO}_3$  at temperatures 380 - 390 °C for 3-5 min; ii) washing in a bath with flowing water;
- iii) pickling in a solution containing 18% of  $\text{H}_2\text{SO}_4$  and 3% of NaCl at a temperature not exceeding 60 °C for 30-60 sec; iv) washing in water.

Card6/6

SOV/133-59-6-24/41

AUTHOR: Zhetvin, N.P., Candidate of Technical Sciences  
TITLE: At the Moscow Works "Serp i Molot" (Na Moskovskom  
zavode "Serp i molot")  
PERIODICAL: Stal', 1959, Nr 6, pp 550-551 (USSR)

ABSTRACT: 1. Determination of the depth of cracks in roll passes. The sensitivity of ultrasonic defectoscope UZD-7N was tested on specially prepared plastic and steel specimens. The true depth of defects agreed with that given by tables prepared for the instrument. In experiments on the determination of cracks in rolls of 450 and 750 mills, cracks 35-40 mm deep were found which was later confirmed during machining of the rolls. The use of the defectoscope permitted pre-arrangement of roll repairs thus preventing breakdowns.  
2. Mastering of the process of straightening of stainless steel in hardened and soft state on a straightening-stretching machine. The most suitable conditions for stretching sheets from EI 904 steel were found to be  $\sigma_s$  55-70 and  $\sigma_B$  100-120.

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At the Moscow Works "Serp i Molot"

SOV/133-59-6-24/41

3. Introduction of the process of drawing wire from steels of low plasticity using preheating. Drawing of steels R18, EI 701, from 6.0 mm diameter to 4.5 mm in 4 passes with a velocity 10 - 12 m/min with preheating in a gas fired furnace was successfully introduced.

4. Development of the method of producing "silver wire" with a 5 microns tolerance. Optimum grinding conditions for the production of "silver wire" from steels U7AV and U10A of 0.9 - 3.0 mm in diameter (for the clock and watch making industry) with a tolerance of 0.005 mm were determined.

Card 2/2

18.7100, 18.7500

77594  
SOV/129-60-2-7/13

AUTHORS: Zhetvin, N. P., Podvoyskiy, L. N. (Candidates of  
Technical Sciences), Krylova, L. I. (Engineer)

TITLE: Investigation of Decarburization Kinetics of Ball  
Bearing Steel During Heat Treatment

PERIODICAL: Metallovedeniye 1 termicheskaya obrabotka metallov,  
1960, Nr 2, pp 37-42 (USSR)

ABSTRACT: The experiments on the above subject were carried out  
at the laboratory of "Serp 1 molot" Plant (Zavod  
"Serp 1 molot"). Since it is very difficult to  
separate processes of scale formation and decarburiza-  
tion, which proceed simultaneously, the variation of  
carbon concentration in the surface layer after scale  
removal was selected as criterion of decarburization.  
After thorough study of decarburization in the initial  
rolled state, ShKh9- steel specimens (C, 1.00-1.10; Cr,  
0.90-1.20; Mn, 0.20-0.40; Si, 0.15-0.35; S, 0.020;

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Investigation of Decarburization Kinetics  
of Ball Bearing Steel During Heat Treatment

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$P \leq 0.027\%$ ) were heat-treated in a laboratory electric muffle furnace at 700, 720, 740, 760, 780, 800, and 820° C, with holding periods from 1 hr to 16 min in oxidizing medium and in a tube filled with cast iron chips without access of air. To determine the role of the initial decarburization in the decarburization process, samples with scale of rolling origin and those machined for complete removal of decarburized layer were heat-treated. Heat-treated samples were studied microscopically, etched for scale removal, and machined for determination of carbon content at 0.20, 0.40, and 0.60 mm depth. Figures 1-4 illustrate the results of these tests.

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Investigation of Decarburization Kinetics  
of Ball Bearing Steel During Heat Treatment

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30V/129-60-2-7/13

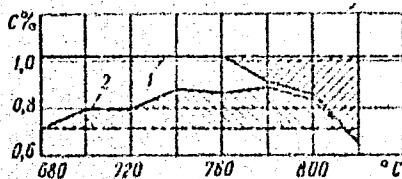


Fig. 1. Effect of temperature on variation of carbon content at 0.2 mm depth during annealing in oxidizing medium for eight hrs: (1) machined samples; (2) samples with scale.

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Investigation of Decarburization Kinetics  
of Ball Bearing Steel During Heat Treatment

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30V/129-60-2-7/13

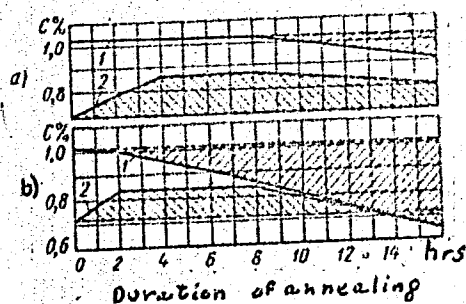


Fig. 2. Effect of time on variation of carbon content at 0.2 mm depth during annealing at 800°C: (a) in the tube; (b) in oxidizing medium; (1) machined sample; (2) sample with scale.

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Investigation of Decarburization Kinetics  
of Ball Bearing Steel During Heat Treatment

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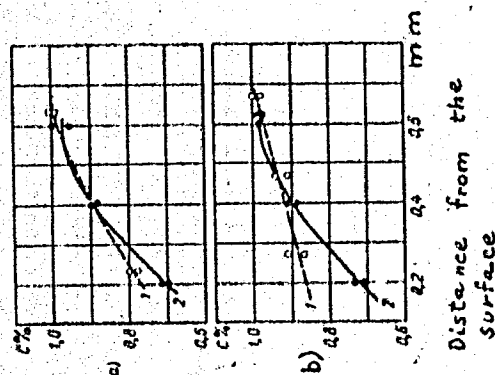


Fig. 3. Variation of carbon content in scale-covered annealed specimens after annealing for 8 hr (a) at 720° C; (b) at 780° C; (1) after annealing; (2) before annealing.

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Investigation of Decarburization Kinetics  
of Ball Bearing Steel During Heat Treatment

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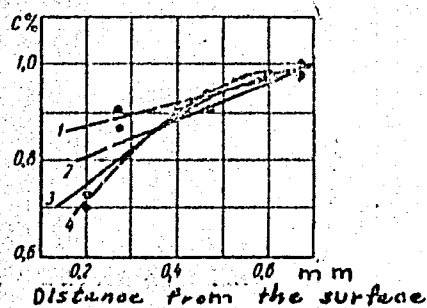


Fig. 4. Variation of carbon concentration (1) after annealing in oxidizing medium; (2) after annealing in tube; (3) before annealing in tube; (4) before annealing in oxidizing medium.

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The following conclusions were made as a result

Investigation of Decarburization Kinetics  
of Ball Bearing Steel During Heat Treatment

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of the study: (1) Decarburization processes in ShKh9-steel do not develop at temperatures below 740° C and holding up to 16 hr. This concerns annealing of metals with or without scale in oxidizing medium or in the tube filled with fresh cast iron chips. (2) Decarburization processes develop at temperatures above 740° C and are intensified with time. For machined samples in oxidizing medium decarburization starts at: 760° C, 8 hr; 780° C, 44 hr; 800° C, 2 hr; 820° C, 1 hr. (3) For scale-covered specimens and for specimens with a previously decarburized surface layer, slight carburization (up to 1.8%) starts at 700-800° C due to diffusion processes. However, carbon content never reaches that of the initial carbon content in steel. (4) Considerable carburization of surface layer of scale-covered specimens indicates the protecting action of scale against decarburization during heat treatment. (5) No decarburization was observed either on machined or nonmachined specimens with a surface

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initially depleted of carbon after heat treatment for 8 hr at maximum temperatures of 800° C in a tube filled with carbon chips. (6) The statement of some authors that decarburized layers can be transformed into scale was not confirmed. (7) It is advisable to anneal rolled ball-bearing steel semiproduct at 760-780° C for the purpose of decreasing decarburization. Holding at temperatures above 760° C for more than 8 hr is not permitted. Pickling of rolled semiproduct promotes decarburization. (8) In order to decrease the annealing period and temperature drops in the metal, it is necessary to provide spaces between metal parts and decrease weight of metal charge in the furnace. (9) Pearlite grain structure is produced across the total cross section of the rod by annealing sized components in tubes (for stress relieving and structure equalization) at maximum temperatures of 740° C and maximum holding time of 10-12 hr. Bright annealing above 740° C leads to the formation of

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lamellar pearlite in the surface depleted of carbon.  
There are 4 figures; and 2 Soviet references.

ASSOCIATION: "Serp i Molot" Plant (Zavod "Serp i molot")

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80194

S/129/60/000/04/002/020

E073/E535

18.7100

AUTHORS: Zhetvin, N. P., Podvoyskiy, L. N., Candidates of Technical Sciences, Palsov, A.I. and Kapustina, Ye. P., Engineers

TITLE: Magnetic Ageing of Soft Steel

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, 1960, No 4, pp 15-19 (USSR)

ABSTRACT: The magnetic ageing is characterized by an increase in the coercive force due to the formation of rejection products of a certain degree of dispersion. According to results of the authors of this paper and data in the literature it is necessary to hold the material for 500 to 600 hours at 100°C for attaining full ageing, although in practice the holding time is usually limited to between 100 and 200 hours. The authors carried out a series of experiments on commercial heats of rimming and killed low carbon electrical steel produced by "Serp i molot". Standard specimens of 400 x 40 mm, 1 to 4 mm thick were annealed at 920°C for two hours, cooled at a rate of 40°C/hour to 600°C and then cooled in air. After

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E073/E535

#### Magnetic Ageing of Soft Steel

annealing the specimens were aged. The coercive force was determined by means of a ballistic instrument with an open circuit, the accuracy being 0.02 Oe. The experiments have shown that ageing at 100°C for 100 hours results in an increase of the coercive force to approximately double in the case of rimming steel and to about 1.5 times in the case of killed steel; for ageing durations of 600 hours the increase is three times and twice respectively (see Fig 1). The effect of ageing at 100°C as a function of time (up to 300 hours) for steel containing 0.018% C and 0.012% N after having been annealed at 920°C is graphed in Fig 2. If the annealing temperature is reduced from 920 to 850°C the tendency to magnetic ageing decreases to some extent (see Table 1). By increasing the content of aluminium whilst maintaining the content of oxygen and nitrogen unchanged, the magnetic ageing of killed low carbon electrical steel can be almost entirely eliminated (see Table 2). In Fig 4

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E073/E535

### Magnetic Ageing of Soft Steel

the influence is graphed of refining in hydrogen on the tendency to magnetic ageing for rimming steel. In Fig 5 the influence of repeated anneals on the coercive force of killed steel is graphed for steel containing 0.015% Al (curve 1) and for steel containing 0.30% Si (curve 2). It is concluded that the tendency to magnetic ageing of low carbon electrical steel is due to the increased gas saturation. Slow cooling after annealing does not eliminate the tendency to magnetic ageing but a reduction in the annealing temperature from 920 to 850°C does reduce this tendency. Refining annealing in hydrogen reduces considerably the tendency to magnetic ageing. An increase in the Al content to 0.010-0.015% for a steel containing up to 0.015% nitrogen and up to 0.006% oxygen eliminates the tendency to magnetic ageing. However, Al additions make it difficult to achieve low coercive force values. There are 5 figures, 2 tables and 6 references, 3 of which are Soviet, 2 German and 1 French.

ASSOCIATION: Zavod "Serp i molot" ("Serp i molot" Works)  
Card 3/3

ZHETVIN, N.P.

18.11.50  
AUTHORS:

81880  
8/129/60/000/08/007/009  
E073/E135  
Zhetvin, N.P., Podvoyskiy, L.N., (Candidates of Technical Sciences), and Krylova, L.I. (Engineer)  
Brittleness of Cold Drawn Steel Kh18

TITLE:

PERIODICAL:

Metallovedeniye i termicheskaya obrabotka metallov, 1960, No 8, pp 30 and 35-38

TEXT:

According to data published in literature the strength and ductility of high chromium steels and also the wear resistance depend to a great extent on the structure and composition of the carbides. In selecting the heat treatment regime it is necessary to bear in mind that to obtain carbide in the equilibrium state requires long heating in the range of perlitic transformation. There is a further complication that steels with high contents of chromium and carbon are prone to overheating if heated above 1200 °C. To determine the influence of the individual stages of the technology on the embrittlement and for selecting optimum test methods on specimens from current production batches, the authors investigated the influence of storing at room temperature and at below-zero temperature, the influence of tempering and also the

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81880

S/129/60/000/08/007/009

E073/E135

# Brittleness of Cold Drawn Steel Kh18

influence of plastic deformation. The investigations were carried out on the steel Kh18 (0.9% C; 0.7% Mn; 17-19% Cr; 0.6% Ni;  $\geq 0.8\%$  Si;  $A_{c1}$  830 °C;  $A_{r1}$  810 °C). It was established that an increase in the normalization temperature from 1000 to 1200 °C leads to a decrease in the hardness from 2.8 to 3.9 mm (measured from the diameter of a Brinell indentation) owing to an increase of the content of residual austenite in the steel. It can be seen from the data given in Table 1 that in the case of normalization at 1000 °C tempering brings about an increase in ductility, whilst in the case of air hardening from 1200 °C tempering reduces the ductility and increases hardness. Storage at temperatures of -5 to -10 °C for 14 days reduces the ductility in the case of air hardening, both with and without annealing. On the basis of the obtained results (Tables 1-6) the following conclusions are arrived at.

- 1) Prior to rolling the metal should not be heated above 1150 °C since in the case of overheating the structure of the rolled metal will contain residual stable austenite.
- 2) Storage of hot rolled metal at room temperature or at below zero temperatures is not permissible for normal rolled and for

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overheated metal. In normal rolled metal the brittleness is due to residual stresses which occur after cooling the metal in air and in overheated metal it is due to austenite-martensite transformation.

3) Directly after rolling the material should be tempered at 720-740 °C for removing the stresses and for partial decomposition of the residual austenite. Tempering of hot rolled metal enables obtaining a perlite-troostite structure, removing thereby the after effects of overheating.

4) For ensuring the required properties for cold working, the following regime is recommended: isothermal annealing at 880 °C for 3 hours followed by cooling at a speed of 30 °C/hour to 700 °C, holding at that temperature for 4 hours and then cooling in the furnace to 650 °C followed by cooling in air.

5) The authors also recommend isothermal annealing for increasing the ductility of the overheated metal.

6) In producing wire from the steel Kh18 it is necessary to ensure a minimum duration of the storage of the cold worked, non heat treated wire which should not exceed 8 hours.

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Brittleness of Cold Drawn Steel Kh18

The X-ray structural analysis was carried out by Engineer  
Belostotskaya, TsZL Zlatoustovsk Metallurgical Combine.

There are 6 tables and 8 references: 7 Soviet and 1 German.

ASSOCIATION: Zavod "Serp i Molot"  
(Serp i Molot Works)

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X

S/129/60/000/011/005/016  
E073/E535

AUTHORS: Zhetvin, N.P. and Podvoyskiy, L.N., Candidates of  
Technical Sciences, Paisov, A.I. and Kapustina, Ye.P.,  
Engineers

TITLE: Heat Treatment of Low Carbon Electrical Steel ✓

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov,  
1960, No.11, pp.20-24

TEXT: The author reviews current practice of heat treatment  
of low carbon electrical steel for rimming steel and for killed ✓  
steel. For rimming steel he considers as the most progressive  
method of heat treatment refining annealing in hydrogen. This  
results in a considerable reduction of the coercive force, the  
non-uniformity of the properties and also the tendency to magnetic  
ageing, in addition to preventing or eliminating brittleness. The  
hydrogen also prevents oxidation of the surface. Annealing in  
moist hydrogen has the most intensive effect on decarburization ✓  
and reducing the coercive force (see Table 3). In the case of  
repeated annealing, the use of dry hydrogen is preferable; the  
best properties are obtained by combined annealing in wet and dry  
hydrogen. In the case of killed steel, annealing at 850 to 870°C  
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# Heat Treatment of Low Carbon Electrical Steel

yields a lower coercive force than annealing at 920°C. However, in the case of double or treble annealing, better results are obtained in the case of annealing at 920°C. In killed steel, aluminium nitrides, which are stable up to approximately 1200°C, impede the growth of the austenite grain and bring about a grain refining during  $\gamma \rightarrow \alpha$  transformation; therefore, annealing at 920°C does not yield any advantage from the point of view of grain size as compared to annealing at 850°C. Long duration annealing in the inter-critical temperature range (850°C) leads to formation of small quantities of austenite, which is carbon enriched, and of a ferrite component which is poor in carbon. This favourable influence of the carbon redistribution over-shadows the effect of decarburization during the first annealing above the upper critical point and further decarburization during the second and third anneal above the critical point over-shadows the effect of redistribution of the carbon. The following conclusions are arrived at:

- 1) Annealing of low carbon electrical steel should be carried out in a decarburizing medium. The practice of some Works of annealing in iron chips reduces the possibility of obtaining a low coercive

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# Heat Treatment of Low Carbon Electrical Steel

force.

- 2) For preventing oxidation of components during annealing, the use is recommended of a mixture of one part of soft steel chips and two parts sand, instead of annealing in iron chips.
- 3) Rimming steel should be annealed above the upper critical point. In this case an increase of the annealing temperature from 900-920°C to 950-980°C brings about a coarsening of the grain, decarburization and lower coercive force values.
- 4) A single anneal of killed steel at 850-870°C yields a lower coercive force than annealing at 920°C, whilst in the case of repeated annealing, the temperature should preferably be 920°C.
- 5) After annealing, the steel should be cooled down to 600°C with a speed of 40°C/hour or slower, with subsequent cooling in air.
- 6) Refining annealing in hydrogen reduces considerably the coercive force, reduces the tendency to magnetic ageing and also permits preventing or even eliminating brittleness which is a characteristic feature of rimming steels. There are 6 figures, 4 tables and 5 Soviet references.

ASSOCIATIONS: Zavod "Serp i Molot" ("Serp i Molot" Works) and  
Card 3/3 MATI

S/137/62/000/005/122/150  
A160/A101

AUTHOR: Zhetvin, N. P.

TITLE: The production of wire from stainless heatproof and heat-resistant steel

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 5, 1962, 128, abstract 51780  
("Tr. Konferentsii po metizn. proiz-vu, 1959". Chelyabinsk, 1961, 79 - 90)

TEXT: Investigated are the characteristics of production and thermal treatment of a stainless wire which is classified by its structure. The conditions for the heat-treatment of the wire - made from various types of steel in accordance to their classification - are presented. An intensive softening of the cold-drawn wire from the 1X18H9 (1Kh18N9)-type austenite steel is noted at 750 - 850°C. The optimum temperature for quenching the wire is 900 - 1,000°C, and for alloys on Ni-basis, alloyed with Nb, Ti, Al and W - 1,050-1,150°C, since an increase in the degree of alloyability raises the temperature of recrystallization. The softening of a cold-drawn X 17 (Kh17)-type ferrite steel shows that

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The production of wire...

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the recrystallization is completed at 750°C. The best combination of properties is obtained at a thermal-treatment temperature of 700 - 800°C. Wires from 1X13 - 4X13 (1Kh13 - 4Kh13)-type martensite steel are annealed in coils. They are left in the furnace for two hours and are then cooled in water. The best properties for wires from austenitic-ferrite steels are obtained at a quenching of 900 - 1,000°C. In practice, austenitic-martensite steels are quenched and then cooled in the air; wire rods of intermediate sizes from 1,050°C, and finished wire at 950 - 1,000°C. Technological schemes are presented, showing the combined alkali-acid method of pickling the wire to remove scales from the surface. The technology of drawing is briefly described.

[Abstracter's note: Complete translation]

A. Babayeva

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S/148/61/000/003/002/015  
A161/A133

AUTHORS: Chelishchev, Ye. V., Turkenich, D. I., Zhetvin, N. P., Tunkov, V. P.

TITLE: Investigating the metal composition on different levels of the open-hearth furnace bath

PERIODICAL: Izvestiya vysshikh uchebnykh. zavedeniy. Chernaya metallurgiya, no. 3, 1961, 31 - 36

TEXT: Two different views exist on the position of the decarbonizing reaction zone in the open-hearth furnace bath - according to the first this reaction takes place on the bottom according to the second on the metal-slag boundary. Large sampling devices always mixed the metal and caused different conclusions. The article presents information on an investigation carried out at the "Serp i molot" Plant with the aid of a new sampling device with a swiveling box and three 1-inch diameter pipes of different length, each pipe fitted with a metal shell on the end containing quartz metal receivers. A ball was blown on the receivers intake end and provided with a 1 mm diameter input hole that was plugged with aluminum. The aluminum melted after submersion and deoxidized metal filled the receiver. A spiral of aluminum wire in the receiver completed the deoxidation.

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Investigating the metal composition on different levels...A161/A133

Distances between the sampled metal levels were determined by the difference in length of the pipes. The carbon and oxygen contents indicated that the reaction takes place mainly in the transition layer between slag and metal spreading with the progress of carbon oxidation. The formation of the transition layer was verified on a model, and it was established that all the slag was absorbed by the metal at slag-to-metal layer depth ratio of 1:5 and a rimming intensity in the range of 0.3 and 0.6% C/h. The slag layer turned into a metal emulsion, and pure slag separated on the surface with an increasing slag quantity, or at a reduced carbon-burning rate. The slag layer in the investigated 50-ton furnace constituted 0.25 of the metal bath depth, which ensured a good intermixing of the metallic phase. Conclusions: 1) A definite regularity exists in the distribution of carbon and oxygen over the metal bath depth. The carbon content in the upper levels (particularly on the boundary with slag) is lower than in the deeper levels. Oxygen is distributed in an inverse way, and this proves that the de-carbonizing reaction goes on at the metal-slag boundary. 2) The maximum carbon concentration drop between the top and bottom of the 50-ton bath was 0.1%. In most of the cases the difference was lower, particularly at a low carbon content in the metal. Highest deviation of the carbon content from the mean in the metal volume was in the thin sub-slag layer. Sampling from this layer may cause differences in carbon determinations in the furnace and in teeming. 3) The intermixing

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Investigating the metal composition on different levels...A161/A133  
S/148/61/000/003/002/015  
of metal during the melting of low-carbon steel changes this sub-slag layer  
and may speed up decarbonization and reduce the carbon content. There are 5 figures  
and 1 Soviet-bloc reference.

ASSOCIATION: Moskovskiy institut stali i metallurgicheskoy zavod "Serp i molot"  
(Moscow Steel Institute and "Serp i molot" metallurgical plant) .

SUBMITTED: July 5, 1960

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ZHETVIN, N.P., kand. tekhn. nauk

Developing a process for the production of semikilled steel.  
Stal' 21 no.6:518 Je '61.  
(Steel ingots) (MIRA 14:5)

S/133/61/000/006/008/017  
A054/A129

AUTHOR: Zhetvin, N. P., Candidate of Technical Sciences

TITLE: News in brief

PERIODICAL: Stal', <sup>21</sup>no. 6, 1961, 522

TEXT: 1) At the Metallurgicheskii zavod "Serp i Molot" (Metallurgical Plant "Sickle and Hammer") tests were carried out to obtain killed, non-aging steel for the electric engineering industry with a maximum nitrogen content of 0.015%, a maximum oxygen content of 0.006%, and a maximum coercitive force of 0.8 oersteds. In the tests armco iron was alloyed with silicon in such an amount to obtain a maximum of 0.3 - 0.5% silicon in the finished product. Silicon was introduced in the form of 75% ferrosilicon in the amount of 0.9 kg/t during tapping, in the metal jet. Oxidation of silicon was prevented by adding also 0.4 kg/t of aluminum, which is sufficient for binding nitrogen. The tendency of the metal to magnetic aging which depends on the oxygen and nitrogen content and the  $H_c$ -value could most efficiently be decreased by annealing, first in moist next in dry hydrogen. After conventional annealing at 920°C the  $H_c$ -value amounts to 0.53 - 0.66 oersteds, after aging at 100°C for 100 hours to 0.51 - 0.66 oersteds, ✓

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after annealing at 850°C only to 0.46 - 0.59 oersted. With regard to magnetic induction and magnetic permeability the non-aging, high-silicon iron differs from the conventional killed armco iron only in that it has a slightly higher specific electric resistance (up to 0.16-0.20 instead of 0.13-0.15 ohm · mm<sup>2</sup>/m).  
2) Investigation of the vacuum treatment of armco iron in the ladle showed that when processing rimming steel with a 0.025 - 0.30% carbon content in vacuum for 1-10 minutes at a residual pressure of 3 - 300 mm Hg the oxygen concentration in the metal increased in proportion to the duration of the vacuum treatment. It was not possible to reduce the carbon content and therefore the vacuum-treated metal had to be deoxidized. The amount of flawless product was not more than 30% and therefore the method is uneconomical. When vacuum processing killed steel for 3-7 minutes at a residual pressure of 20-40 mm Hg, the oxygen-content of the metal decreased by 35-45% on an average due to a 40-50% decrease of non-metallic inclusions. The C, Mn, Si and P content of the metal did not change. The best parameters were found for castings which were deoxidized before vacuum-treatment by 75% ferrosilicon (3 - 3.2 kg/t), manganese metal (0.8 - 0.9 kg/t) and aluminum (1.2 - 1.5 kg/t). However, the results are not as good as those obtained with non-vacuum-treated killed armco iron: the yield of 3AA:(EAA)

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A054/A129

1.1300  
AUTHOR:1

Zhetvin, N. P., Candidate of Technical Sciences

TITLE: News in brief

PERIODICAL: Stal' <sup>21</sup> no. 6, 1961, 542

TEXT: 1) In the Metallurgicheskii zavod "Serp i Molot" Metallurgical Plant "Sickle and Hammer") tests were carried out to improve the technology of hollow drill steel. When the initial hole diameter is increased from 27 to 29 mm (and the core diameter accordingly from 26 to 28 mm), the shape of the hole in the finished metal is improved and the amount of first-class quality product increased from 70-80% to 94%. When controlling the dimensions of the hole it is necessary to cut 10-15 mm off the extraction end of the rod as the hole will expand and the actual dimensions of the channel will be distorted when the core is removed. 2) The technology for hardened strips made of 1Kh18N9 (1Kh18N9) steel was also improved. Test rollings of 1Kh18N9 ingots produced in a high-frequency furnace (with various C, Cr, Ti and Ni content of the steel within the limits allowed for this grade) and with other constituents occurring in average amounts have shown that nickel has the greatest effect on the mechanical properties of

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News in brief

steel. When the nickel content is above 10%, the required parameters cannot be obtained for the steel, whatever the amount of the other components, due to the high stability of austenite. The effect of titanium becomes noticeable at a content above 0.3% and is strongest with a high nickel content. The optimum steel composition for hardened strips is (in %): C - 0.09 - 0.12; Cr - 17 - 18; Ni - 8-9; Ti - below 0.3. In order to obtain the required mechanical properties, a new steel grade (X17H7 = Kh17N7) should be standardized containing (in %): 0.06-0.10 C, 16-18 Cr, 6.5-8 Ni and less than 0.3 Ti. 3) A technology has been established for hot-rolling sheets from deformation-resistant steels. Hot-rolling tests on laboratory equipment with deformation-resistant steels (EI100 - EI 100, EI268, EI602, EI835, BOK-98 = VZh-98, EI925, etc.) at 20°, 100° and 200°C showed the highest degree of plasticity in EI100 and EI925 steels, which have an unstable austenitic structure. In this case, by preliminary heating to 100°-200° C in the roller-type furnace, it is possible to reduce the passes by 2-4 in cold rolling and by 1-2 passes when rolling other steels. With semi-hot rolling of high-speed (P9 = R9) steels into thin sheets on a double-roll hot rolling stand it was possible to improve the surface and the size-accuracy of the sheet. The best results were obtained when slabs were rolled hot with an allowance of

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A054/A129

AUTHOR: Zhetvin, N. P., Candidate of Technical Sciences

TITLE: News in brief

PERIODICAL: Stal',<sup>21</sup> no. 6, 1961, 557

TEXT: 1) In the Metallurgicheskiy zavod "Serp i molot" (Metallurgical Plant "Sickle and Hammer") tests were carried out to increase the resistance of 1X18H9T (1Kh18N9T) steel-strips against intercrystallite corrosion which mainly develops when the titanium content of the steel is close to the lower limit allowed for this grade. It was found that upon a Ti : C ratio below 4.5 it is expedient to start hardening at 980° - 1,000° C instead of 1,050 - 1,080° C as prescribed. When lowering the hardening temperature still further to 850° - 975° C the resistance to intercrystallite corrosion increases, however, in that case the holding time has to be extended considerably. The lower hardening temperature also complicates the removal of cinder during pickling (pickling time has to be raised as well). The optimum Ti-content was obtained at Ti : C > 4.5. The upper limit of Ti-content can invariably be kept at 0.8%. 2) In tests carried out to investigate the wear-resistance of T13V (G13L) steel ingots, the time

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required for the equalization of carbon-concentration in the steel was determined micrographically by means of  $C^{14}$ -isotope at the TsNIICM, while the time required for the equalization of manganese concentration was investigated by local X-ray spectral analysis in the Institut metallurgii AN USSR (Institute of Metallurgy of the USSR Academy of Sciences). It was found that the conventional hardening process (from  $1,050^{\circ}\text{C}$  with a holding time of 2-3 hours) yielded the best results, whereas when heating to  $1,150^{\circ}\text{C}$  as suggested by TsNIITMASH an increase in grain size was observed after a holding time of 5 hours, in some cases already after 2 hours. The wear-resistance was measured by losses in weight and by shrinkage of the samples in a machine under simultaneous impact loads and attrition after hardening in turn from  $950^{\circ}\text{C}$ ,  $1,050^{\circ}\text{C}$  and  $1,150^{\circ}\text{C}$  for 2, 4, 8 and 12 hours. At a Mn : C ratio above 10 the highest wear-resistance was obtained by hardening from  $1,050^{\circ}\text{C}$ , and at a Mn : C ratio below at  $950^{\circ}\text{C}$ . At this hardening temperature low impact toughness was obtained. Wear-resistance was as a rule reduced when the heating time was extended beyond 2 hours (mainly at  $1,150^{\circ}\text{C}$ ).

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S/133/61/000/006/016/017  
A054/A129

AUTHOR: Zhetvin, N. P., Candidate of Technical Sciences

TITLE: News in brief

PERIODICAL: St<sup>2</sup>, no. 6, 1961, 559

TEXT: 1) At the Metallurgicheskii zavod "Serp i Molot" (Metallurgical Plant "Sickle and Hammer") tests were made to improve the hot-drawing process of wire and rods. The optimum preheating temperature for P18 (R18) steels is 500 - 600°C, whereas the optimum temperature for drawing is at 280 - 320°C or 460 - 600°C. When drawing at 340 - 440°C, plasticity decreases. In order to prevent cinder formation at high temperatures, the metal should be heated rapidly, preferably in an induction furnace or in some protecting medium. When drawing 6.5 - 4.8-mm or 4.9-mm wire rods heated in a gas furnace to 280 - 320°C, two-three intermittent thermal treatments and pickling could be dispensed with and it was also found that the number of ruptures was reduced at the same time. 2) Tests were carried out on dry and wet coating materials used in drawing wires and rods at the Metallurgicheskii zavod "Serp i Molot" (Metallurgical Plant "Sickle and Hammer") in cooperation with the "Neftegas" plant. It was investigated whether it

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was feasible to replace the conventional soap-powder by sodium and calcium soaps of synthetic fatty acids (in a narrow range of fractions:  $C_5 - C_6$  and  $C_{17} - C_{21}$ ) and to replace machine oil by the aqueous solution of soaps of synthetic fatty acids ( $C_5 - C_6$  fraction) with the addition of soap-naphtha, water-soluble sulfonates, (as anti-corrosion constituent) and ON7 (OP7) solutions. 147 alternatives of the coating-lubricant-steel brand system were studied and the following conclusions were drawn: 1) In rough drawing of stainless steel the coating should consist of common salt, the lubricant of a dry mixture of powdered sodium nitrite and the OP7-preparation, or: sodium sulfate and alkyl sulfate of sodium in a 1 : 1 ratio by volume; 2) In drawing carbon-containing cable steel, the coating should be of borax or borax + trisodium phosphate, the application of which increased the output of the drawing mill by 15-20%, while the best lubricant was synthetic sodium soap of the  $C_5 - C_6$  fraction; 3) The thermal pickling unit of the GIPROMETIZ was improved by the Metallurgical Plant "Sickle and Hammer" in the following way: the steel tubes were replaced by thin-walled, 6-channel ceramic muffs. Instead of gas protection the operating channels were insulated only and in order to decrease the oxidation of the wire, its heating temperature was lowered to  $880^\circ - 920^\circ C$ . The drawing rate for 3.3 - 3.8-mm diameter wire was increased to 10.5 m/min., pickling temperature was raised to  $80^\circ - 90^\circ C$  and its duration

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from 30 to 43 seconds. The drawing velocity for cable wire was increased to 560 - 720 m/min. The metal consumption coefficient for wire was decreased from 1.075 to 1.067, in 1960. 4) The conditions of heat-treatment in the calibrating workshop had to be established in connection with the reconstruction of the furnace for gas-fuelling. By using gas instead of oil the temperature drops in the charge increased from 20° to 60°C. Moreover, it became difficult to maintain the positive pressure in the furnace. As there was 1% moisture in the combustion products, the waste caused by structural defects and insufficient decarbonization increased, the pickling property of the metal after annealing was weakened, because cinder became more compact. In order to make cinder more friable, the roll-product was pickled before annealing and soaked in an 8% NaOH solution. During this process, however, the surface layer of the metal was decarbonized to a clean ferrite. These drawbacks could be partly eliminated by introducing the combustion products also under the lower part of the charge, but a reconstruction of the furnace into the recirculation type proved inevitable. Y

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S/133/61/000/006/017/017  
A054/A129

AUTHOR: Zhetvin, N. P., Candidate of Technical Sciences

TITLE: News in brief

PERIODICAL: Stal' <sup>21</sup>/<sub>A</sub> no. 6, 1961, 570

TEXT: 1) In the metallurgicheskii zavod "Serp i Molot" (Metallurgical Plant "Sickle and Hammer") tests were carried out on the continuous electrolytic contactless pickling of stainless steel strips and wire. The cathode pickling was effected with laboratory equipment in a 100-% smelt of caustic soda, followed by washing in water, anode-pickling in acidic electrolyte, blanching and passivation in a 8-10%  $\text{HNO}_3$  solution. The best composition of acidic electrolyte for high-alloy 1X18H9 (1Kh18N9), 1X18H9T (1Kh18N9T), 3X1 35 (EI435), 3X1 432 (EI432), 1X13 (1Kh13), 3X1 100 (EI100) steels was 5%  $\text{Na}_3\text{PO}_4$  + 3.2%  $\text{H}_2\text{SO}_4$  or 3%  $\text{H}_2\text{SO}_4$  + 1%  $\text{HNO}_3$ . A fully pickled surface can be obtained at a current density of 30-40 amp/ $\text{dm}^2$  for wires in 12 sec and for strips at 10-15 amp/ $\text{dm}^2$  in 7.5 sec. These values are 3-4 times lower than when no current is applied. 2) Tests were carried out to investigate the effect of common salt when added to the pickling solution and it was found that the optimum composition for the pickling of

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1X18/9T (1Kh18N9T), 3M435 (EI435), 3M962 (EI962), 3X13 (3Kh13), 3M811 (EI811) and other steels was NaOH 60-65%; NaNO<sub>3</sub> 35-30%; NaCl 5%. Lowest metal losses and greatest pickling rate was observed at 450 - 475 °C. The quality of pickling chrome-containing steels improved considerably upon adding NaCl. Due to lower viscosity less solution is lost. 3) The effect of various methods of remelting electric engineering steel (armco-iron type) on its vacuum-density was investigated. The conventional open-hearth armco-iron is largely polluted by non-metallic inclusions, its gas-content is also high; the finished product contains flakes and no vacuum-density could be obtained. These defects could not be eliminated by induction remelting. However, when remelting in vacuum, flakes and microfractures do not occur, the amount of non-metallic inclusions suddenly decreases, magnetic and plastic properties improved. The quantity of C, Si, Mn and S-admixtures decreased 3-4 times, that of oxygen and hydrogen 3 times, nitrogen by 30% and a satisfactory vacuum-density could be obtained. The complex consumption coefficient for rimming armco iron when remelted in vacuum amounts to 3.65, for killed steel to 2.20. When remelting under slag (with "baking electrode"), according to Paton's method the flakes and microfractures disappear as well, the amount of non-metallic inclusions decreases, but the mechanical and magnetic properties of the metal, the gas-content and the amount of admixtures

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ZHETVIN, N.P., kand.tekhn.nauk

Welding up cast iron molds without preheating. Stal' 21 no.6:575  
Je '61. (MIRA 14:5)

(Ingot molds—Welding)

270714, N.I.

PHASE I BOOK EXPLOITATION

SOV/6363

Zhetvin, Nikita Petrovich, Vladimir Pavlovich Tunkov, Mikhail Andreyevich  
Pertsev, Aleksey Ivanovich Paisov, and Lev Nikolayevich Podvoyskiy

Tekhnicheskii chistoye zhelezo (Armco Iron) Moscow, Metallurgizdat, 1962.  
198 p. Errata slip inserted. 2750 copies printed.

Ed.: L. Sh. Kazarnovskiy; Ed. of Publishing House: A. L. Ozeretskaya;  
Tech. Ed.: A. I. Karasev.

**PURPOSE:** The book is intended for engineering personnel at metallurgical  
and machine-building plants. It may also be used by students at schools  
of higher education and tekhnikums studying metallurgy, machine building,  
and electrical equipment.

**COVERAGE:** The book reviews methods of melting, rolling, and heat treat-  
ing low-carbon electrical steel and pertinent problems of its physical metal-  
lurgy. The effect of various impurities and heat treatment on magnetic and

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# Armco Iron

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technological properties of sheets and bars made from this steel is discussed. Suggestions are made on the selection of optimal conditions for heat treatment of low-carbon electrical-steel products and on the improvement of their quality. The assistance of P. Ya. Barzdayn, G. V. Sviridov, O. N. Sokolov, I. I. Fomin, B. N. Sukhotin, L. I. Krylova, Ye. P. Kapustina, Ya. L. Frid, B. M. Maksimov, Ye. M. Kontsevaya, A. D. Zaytseva, I. I. Yelin, I. M. Romanov, N. S. Safronov, A. R. Krylova, B. S. Brusilovskiy, K. N. Belousov, I. B. Tseytlin, and other engineers of the "Serp and Molot" Plant is acknowledged. There are 147 references, mostly Soviet.

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12.1141  
AUTHORS:

Zhetvin, N.P., Candidate of Technical Sciences,  
Tunkov, V.P., Engineer and Paisov, A.I., Engineer

TITLE:

Non-ageing low-carbon electrical steel

PERIODICAL:

Metallovedeniye i termicheskaya obrabotka metallov,  
no.5, 1962, 21-22

TEXT:

The best method of preventing magnetic ageing is to combine nitrogen into stable aluminium nitrides. Introduction into the ladle of large quantities of aluminium causes intensive contamination of the steel by nonmetallic inclusions. Therefore, silicon was used in quantities corresponding to 0.3-0.5% in the finished steel. To reduce the burn-off of silicon, 400 to 600 g of aluminium per ton of liquid steel was first introduced into the furnace. Subsequent addition into the ladle of 400 to 600 g of aluminium per ton of liquid steel (instead of 1500 g/ton added for the usual killed steel) ensures stability against magnetic ageing. Steel of four experimental open-hearth heats were used, the composition of which was: 0.025-0.030% C, 0.11-0.19% Mn, 0.30-0.50% Si, 0.017-0.025% S, 0.010% P, 0.11-0.18% Ni,

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Non-ageing low-carbon electrical ... S/129/62/000/005/003/011  
E073/E535

0.03-0.05% Cr and 0.16-0.22% Cu. Up to 0.5% silicon does not lower the plasticity of low-carbon electrical steel but it does improve the magnetic and electrical properties. The resistivity of an ordinary rimming steel containing up to 0.03% Si is 0.10-0.11 ohm·mm<sup>2</sup>/m, whilst in killed steel with a silicon content of 0.3 to 0.5% it is 0.16-0.20 ohm·mm<sup>2</sup>/m. Annealing should be at 850-870°C. After four-hour annealing at 850°C, followed by cooling at a rate of 40°C/hour down to 600°C and then in air, 2 mm sheet steel with increased silicon content had the following magnetic properties (Gauss/Oe)  $H_c = 0.56-0.78$ ,  $\mu_o = 275-415$ ,  $\mu_{max} = 4640-11500$ ,  $B_5 = 13800-15000$  and  $B_{200} = 21000-21800$ . The coefficient of ageing  $\Delta H_c/H_c \cdot 100\%$  (100°C, 200 hours) was in all cases less than 10%. Experimental batches of steels with increased silicon contents have passed successfully shop tests. Low-carbon (0.03%), low sulphur (below 0.025%) electrical steel with silicon contents increased to 0.3 to 0.5% is recommended for wide use in industry as a non-ageing magnetically soft material with a coercive force below 0.8 Oe. There is 1 figure.

ASSOCIATIONS: "Serp i Molot" Works and MATI

Card 2/2

MAKSIMOV, S.K.; SKAKOV, Yu.A.; ZHETVIN, N.P.; PAISOV, A.I.

Role of phase composition of precipitates in the magnetic aging  
of mild steel. Izv. vys. ucheb. zav.; chern. met. 5 no.3:122-  
124 '62. (MIRA 15:5)

1. Moskovskiy institut stali i zavod "Serp i molot".  
(Steel—Hardening) (Case hardening)

S/133/62/000/006/012/015  
A054/A127

AUTHORS:

Zhetvin, N. P., Candidate of Technical Sciences, Rakhovskaya, F. S.,  
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TITLE:

Continuous electrolytic pickling of carbon steel and stainless steel  
strip and wire

PERIODICAL: Stal', no. 6, 1962, 553 - 555

TEXT:

At the "Serp i Molot" plant on a special pilot installation the continuous electrolytic pickling of wires and strips was studied. OX 18H9 (OKh18N9), 1X 18H9T (1Kh18N9T), 1X 18H11M (1Kh18N11M), 3M 991 (EI991), 3M 349 (EI349) steel grades, moreover a nickel alloy, containing 0.06% C, 0.35% Mn, 0.65% Si, 0.007% S, 21% Cr, 2.5% Ti, 0.05% Cu, 0.9% Fe, 0.65% Al, 0.01% B, 0.01% Zr were tested. The wires made of the above grades were pickled on continuously operating equipment. The first, alkaline bath (at a temperature of 450 - 480°C) contained 100-% NaOH, in the acidic bath (at room temperature or 60 - 80°C) the following compositions were tested: A: 3% H<sub>2</sub>SO<sub>4</sub> + 1% HNO<sub>3</sub>; B: 10% H<sub>2</sub>SO<sub>4</sub> + 3% NaCl; C: 3.25% H<sub>2</sub>SO<sub>4</sub> + 5% Na<sub>3</sub>PO<sub>4</sub>. In the alkaline bath 1Kh18N9T steel sheets were ap-

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APPROVED FOR